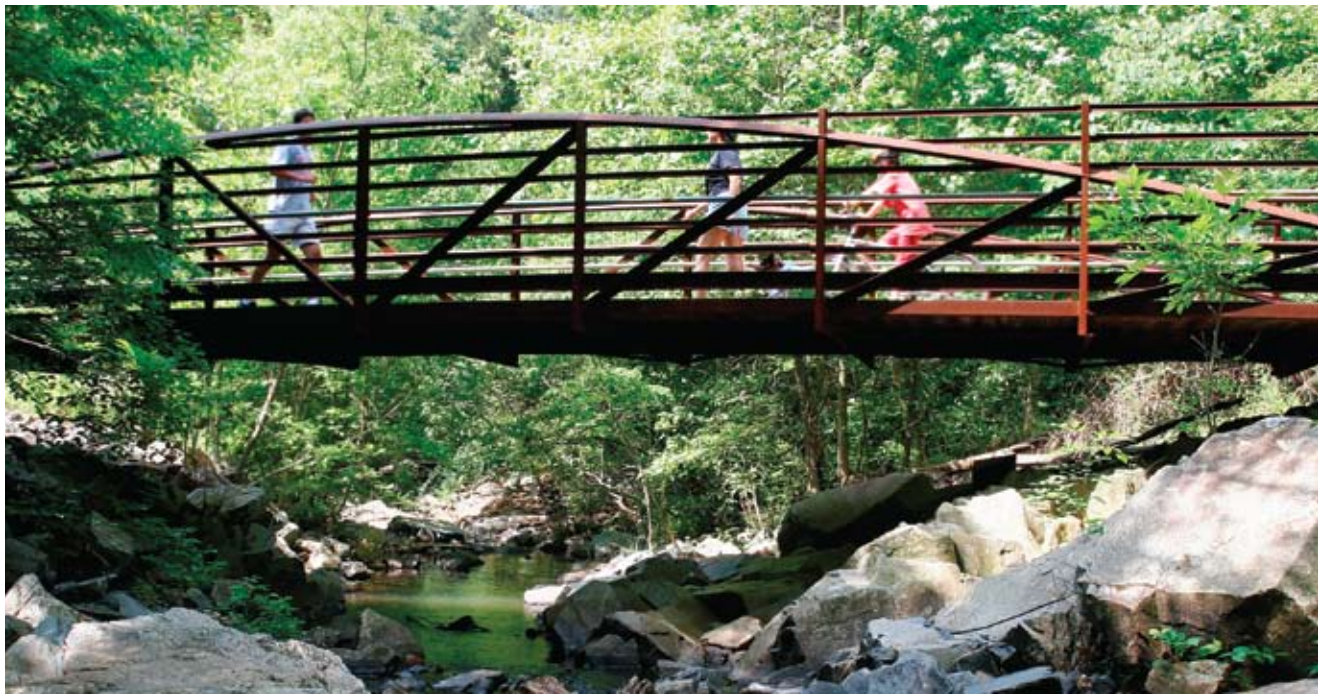
The Economic Benefits of the Park and Recreation System of Mecklenburg County, North Carolina



THE TRUST *for* PUBLIC LAND

CONSERVING LAND FOR PEOPLE

The Economic Benefits of the Park and Recreation System of Mecklenburg County, North Carolina

The Trust for Public Land
Center for City Park Excellence

Cover photos: Left, Allen Brisson; Right, Clark's Creek Greenway, Mecklenburg County Park and Recreation Department.
All other photos: Mecklenburg County Park and Recreation Department

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Executive Summary

With more than 17,600 acres of parkland, 27 recreation centers, 3 nature centers, a public campground, athletic complexes, skating parks, streamside trails, a major whitewater kayaking center, and myriad other recreational amenities, Mecklenburg County's park and recreation system is a significant reason to live in or visit Charlotte and the county in which it is nestled. From the Fourth Ward Park to the McDowell Nature Preserve to the Little Sugar Creek Greenway, the enduring legacy of Mecklenburg parks has great value.

Even when they were originally being created, Mecklenburg County's parks were thought of partly as economic development tools to help put the county on the map. Today, we can now recognize—and, for the first time, define—just how these investments have provided the county with measurable value. Not every aspect of a park system can be quantified—for instance, the dollar value of the mental health benefit of a walk in the woods has not yet been documented and is not counted here—but seven major factors are enumerated in this study: *clean air, clean water, tourism, direct use, health, property value and community cohesion*. The numbers reported here have been carefully tabulated, considered, and analyzed for 2009 or, in the case of property value, for the 2005–2009 period.

Two of the factors provide Mecklenburg County with **direct income** to the county's treasury. The first factor is increased property tax from the increase in value of certain residences because of their proximity to parks. This came to almost $4 million for FY 2009. The second consists of sales tax receipts from tourism spending by out-of-towners who came to Mecklenburg County primarily because of its parks. This value came to more than $4.3 million for Mecklenburg County.

Beyond the tax money, these factors also bolstered the **collective wealth** of Mecklenburgers—by more than $10 million in total property value and by almost $19 million in net income from tourist spending.

Two other factors provided Mecklenburg County residents with **direct savings**. By far the largest savings is from the value of using the county's free parkland and recreation opportunities instead of having to purchase these items in the marketplace. This value came to over $841 million. Second is the health benefit—savings in medical costs from the beneficial aspects of exercise in the parks. This came to more than $81 million.

The last three factors also provided **savings**, but directly to **county government**. Two are of the environmental sort. The first factor involves water pollution reduction. The trees and soil of Mecklenburg County's parks retain rainfall and thus cut the cost of treating stormwater—a benefit that would not exist if parkland had been developed for residential or commercial purposes. This value came to nearly $19 million. The second concerns air pollution—the fact that park trees and shrubs absorb a variety of air pollutants. This value came to almost $4 million. And the third factor is the community cohesion benefit of people banding together to save and improve their neighborhood parks. This "know-your-neighbor" social capital, while hard to tabulate, helps ward off all kinds of antisocial problems that would otherwise cost the county more in police, fire, prison, counseling, and rehabilitation costs. This value came to approximately $2.5 million.

The park system of Mecklenburg County thus provided the county in 2009 with revenue of $8.3 million, a collective increase of resident wealth of almost $29 million, resident savings of more than $922 million, and municipal savings of $25 million.

Summary Table. The Estimated Annual Value of the Mecklenburg County Park and Recreation System

Revenue-Producing Factors for County Government		
Tax receipts from increased property value		$3,913,564
Tax receipts from increased tourism value		$4,372,789
	Total	**$8,286,353**
Wealth-Increasing Factors to Citizens		
Property value from park proximity		$10,030,210
Net profit from tourism		$18,768,404
	Total	**$28,798,614**
Cost-Saving Factors to Citizens		
Direct use value		$841,461,062
Health value		81,489,201
	Total	**$922,950,263**
Cost-Saving Factors for County Government		
Stormwater management value		$18,892,499
Air pollution mitigation value		$3,889,091
Community cohesion value		$2,516,484
	Total	**$25,298,074**

Background

Cities and counties are economic entities. They are made up of structures entwined with open space. Successful communities have a sufficient number of private homes and commercial and retail establishments to house their inhabitants and give them places to produce and consume goods. Cities and counties also have public buildings—libraries, hospitals, arenas, city or county halls—for culture, health, and public discourse. They have linear corridors—streets and sidewalks—for transportation. And they have a range of other public spaces—parks, plazas, and trails, sometimes natural, sometimes almost fully paved—for recreation, health provision, tourism, sunlight, rainwater retention, air pollution removal, natural beauty, and views.

In successful cities and counties the equation works. Private and public spaces animate each other with the sum greatly surpassing the parts. In unsuccessful communities, some aspect of the relationship is awry: production, retail, or transportation may be inadequate; housing may be insufficient; or the public realm might be too small or too uninspiring.

A park system is integral to this equation, but research on the topic has largely been absent in cities even though the economic impact of stadia, convention centers, and museums has been promoted widely. Based on a two-day colloquium of park experts and economists held in Philadelphia in October 2003 (see Appendix II), the Center for City Park Excellence believes that a city or county park system has seven attributes that are measurable and that provide economic benefits to the city or county. (For a listing of studies done on these issues by participants in the colloquium, as well as other studies, see Appendix III.)

Attractive parks increase home values

In 2009, the county of Mecklenburg requested that The Trust for Public Land carry out a study of its park and recreation system based upon this methodology. The following report provides a description and estimate of the economic value of each of the seven attributes of parks in Mecklenburg County. The underlying numerical formulas can be obtained from The Trust for Public Land.

1. Hedonic (Property) Value

Numerous studies have consistently shown that parks and open space have a positive impact on nearby residential property values. The evidence has shown that most people are willing to pay more for a home close to a nice park. Economists call this phenomenon "hedonic value." (Hedonic value also comes into play with other amenities such as schools, libraries, police stations, and transit stops. Commercial office space near parks may also command increased value, but no study has yet been able to quantify it.) Incidentally, property value goes up even if the resident never goes into the park; simply the view of Freedom Park in Charlotte, for example, can be worth extra value for some homebuyers.

Property value near parks is affected primarily by two factors: distance and the quality of the space. While proximate value (i.e., the "nearness" factor) has been documented for up to 2,000 feet from a large park, most of the value is within the first 500 feet. To be conservative, we have limited our measurement to this shorter distance. As for park quality, beautiful natural resource parks with great trees, trails, meadows, and gardens are markedly valuable to surrounding homes. Excellent recreational facilities are also desirable (with some reductions due to issues of noise, nighttime lighting, and parking). Less attractive or poorly maintained parks, however, are only marginally valuable. And parks with dangerous or frightening aspects can reduce nearby property values.

Determining a robust park-by-park, house-by-house property value for a city or county is technically feasible, but it is prohibitively time-consuming and costly. Thus we formulated an extrapolative methodology to arrive at a reasonable estimate. Using computer-based mapping, we identified all residential properties within 500 feet of every significant park and recreation area in Mecklenburg County. (We defined "significant" as parks of one acre or more that are publicly owned within the county boundaries. According to property records of the Mecklenburg County Assessor's Office, there are 42,923 residential properties within 500 feet of parks in Mecklenburg County.)

These properties when measured in 2009 had a combined assessed value of $9 billion. (See Table 1.)

Despite interviews with park professionals, park users, real estate agents, assessors, and law enforcement officials, we determined that there is no simple methodology to measure park quality and its effect on value. The park-proximate effect in Mecklenburg County is complex because of differences between city and noncity land patterns in the county. To more scientifically analyze the hedonic values conferred by parks, TPL conducted a regression analysis of residential property sales from 2005 to 2009. We examined sales over this four-year period in order to have a large enough sample size, and then we applied the resulting coefficient to sales in 2009 to produce the figure for personal wealth to the seller. Our regression showed a 3.33 percent park effect—an additional $8,032 in average sale value per park-proximate unit.

The value of park-proximate residential properties sold in 2009 was $301,811,124. The percent of that value attributable to parks (3.33 percent) yields $10,050,310 in personal wealth to the sellers.

We then determined the amount of tax revenue generated from the additional park value. For park-proximate properties, the portion of property value derived from parks is 3.33 percent; with a millage rate of $1.297 per $100 assessed value, the additional tax received by the county in 2009 was $3,903,313. In addition, the county receives 51 percent of the state deed stamp tax, so the park-generated additional tax revenue to the county in 2009 was $10,251, bringing the total to $3,913,564.

We consider this a conservative estimate for three reasons. First, it does not include the effects of small parks (under an acre), although we know that even minor green spaces have a property value effect. Second, the estimate leaves out all the value of dwellings located between 500 feet and 2,000 feet from a park. Third, it does not include the potentially very significant property value for commercial offices located near parks.

Table 1. 2009 Economic Benefits of Parks to Residential Property Values, Mecklenburg County

Market value of properties within 500 feet of a park	$9,037,517,583
Market value attributable to parks (3.33% of line 1)	300,949,336
Property tax revenue attributable to parks (1.297% of line 2)	**3,903,313**
Value of properties sold in 2009 within 500 feet of a park	301,811,124
Sales value attributable to parks (3.33% of line 4)	10,050,310
State excise tax retained by county (0.102% of line 5)	**10,251**
Sales value attributable to parks and retained by sellers (99.8% of line 5)	**10,030,210**
Total tax benefit to county, 2009 (line 3 plus line 6)	$3,913,564
Total economic benefit to sellers, 2009 (line 7)	$10,030,210

2. Tourism Value

Festival in Freedom Park

The parks of Mecklenburg County attract two kinds of users—residents and out-of-towners. When calculating income from tourists, residents are not counted. While locals may spend money in and around parks, economists treat that as merely a shift in spending from one neighborhood within the county to another. Only the "new" revenue brought to the county from elsewhere is counted here; the value to residents is counted under direct use (see page 9).

The features that encourage people to visit Mecklenburg County for leisure include cultural offerings, nightlife, heritage places, and parks as well as special events that take place there, such as sports and festivals. Mecklenburg County is well known as a regional and national sports magnet. Sports-based tourism clearly generates significant revenues for Charlotte and Mecklenburg County.

Determining parks' precise contribution to the tourism economy requires knowledge of the number of tourists, their activities, and their spending. Based on studies by the Charlotte Regional Visitors Authority, the local organization devoted to tourism in the metropolitan area, we were able to make educated estimates.

Approximately 18 million tourists visited Mecklenburg County in 2008, most of them staying overnight, some coming for just the day. Of this number, we estimate that about 1.7 percent of them, 311,147, came significantly because of parks—either because of a specific event in a park or more generally because of the park's simple beauty or its sporting value. Of that number, approximately 151,679 stayed overnight in a hotel, 70,908 stayed overnight with friends or family, and 88,560 came just for the day. (See Table 2, rows 3, 10, and 16.)

Converting this into spending on food, lodging, and incidentals, again using data from the Charlotte Regional Visitors Authority, we estimated that overnight park visitors in hotels spent almost $41 million, overnight visitors with friends or family spent almost $7.8 million, and day visitors spent almost $4.9 million in 2008. For the overnight visitors staying in hotels, we applied an average of the sales and hotel taxes of 8.125 percent. We then applied the sales tax rate of 8.25 percent to the day visitors and to the overnight visitors staying with friends or family. Combined, the total 2008 tax revenue to the county from park-based tourism was $4,372,789.

In addition, since 35 percent of every tourist dollar is considered "profit" to the county economy (the rest of the income is merely pass-through to pay for expenses), the citizenry's collective increase in wealth from park-based tourism was $18,768,404.

Table 2. Tourism Value from Parks

I. Overnight Visitors Who Stay in Hotels		
1. Number of visitors to Mecklenburg County who stayed overnight in hotels		4,596,336
2. Number who visited parks [15% of line 1]	0.15	689,450
3. Overnight visitors in hotels who visited parks and came because of parks [22% of line 2]	0.22	151,679
4. Hotel spending per person per day		$80
5. True hotel spending, considering the average trip length of 2 days	2.00	$160
6. Daytime spending of hotel visitors, $55 per day (times 2 days)		$110
7. Spending of overnight visitors who visited parks, came because of parks, and stayed in hotels [line 3 times line (5 + 6)]		$40,953,330
II. Overnight Visitors Who Stay with Friends or Family		
8. Number of visitors to Mecklenburg County who stayed overnight with friends or family		5,908,968
9. Number who visited parks [6% of line 8]	0.06	354,538
10. Overnight visitors who visited parks and came because of parks [20% of line 9]	0.20	70,908
11. Daytime spending of visitors staying with friends or family, $55 per day		$55
12. True daytime spending, considering the average trip length of 2 days	2.00	$110
13. Spending of overnight visitors who visited parks, came because of parks, and stayed with friends or family [line 10 times line 12]		$7,799,880
III. Day Visitors		
14. Number of visitors to Mecklenburg County who came only for the day		7,380,000
15. Number of day visitors to Mecklenburg County who visited parks [6% of line 14]	0.06	442,800
16. Day visitors who visited parks and came because of parks [20% of line 15]	0.20	88,560
17. Spending per day visitor, $55 per day		$55
18. Spending of day visitors who visited parks and came because of parks [line 16 times line 17]		$4,870,800
Total Spending by Park Visitors		
19. Total spending, overnight plus day [lines 7 + 13 + 18]		$53,624,010
Tax Receipts		
20. Tax payments by overnight visitors who stayed in hotels, visited parks, and came because of parks (average sales tax rate of 8.125 percent for hotel) [8.125% of line 7]	0.08125	$3,327,458
21. Tax payments by overnight visitors who stayed in homes, visited parks, and came because of parks (average sales tax rate of 8.25 percent for only food and sundries) [8.25% of line 13]	0.0825	$643,490
22. Tax payments by day visitors who visited parks and came because of parks (average sales tax rate of 8.25 percent for food and sundries) [8.25% of line 18]	0.0825	$401,841
23. Total Tax Receipts		$4,372,789
Profit to Citizenry		
24. Collective profit to the citizens of Mecklenburg County from park visitors who came because of parks [35% of line 19]	0.35	$18,768,404

Estimates are based on data from the Charlotte Regional Visitors Authority.

3. Direct Use Value

Grayson SkatePark

While Mecklenburg County's parks provide much indirect value, they also are an actual amenity and service available to residents. Economists call these activities—basketball and other team sports at the Albemarle Road Recreation Center, bicycling on the Mallard Creek Greenway, cooling off at Ray's Splash Planet, walking the dog in Barkingham Park, or camping in the McDowell Nature Preserve, and much more—"direct uses."

Most direct uses in public parks are free of charge, but economists can still calculate their value by determining the consumer's "willingness to pay" for the recreation experience in the private marketplace. In other words, if parks were not available in Mecklenburg County, how much would the resident (or "consumer") pay for similar experiences in commercial facilities or venues? Thus, rather than income, the direct use value represents the amount of money residents save by not having to pay market rates to indulge in the many park activities they enjoy.

The model for quantifying the benefits received by direct users is based on the "Unit Day Value" method as documented in Water Resources Council recreation valuation procedures by the U.S. Army Corps of Engineers. The Unit Day Value model counts park visits by specific activity and assigns each activity a dollar value. For example, playing in a playground is worth $3.50 each time to each user. Running, walking, or in-line skating on a park trail is worth $4, as is playing a game of tennis on a public court. For activities for which a fee is charged, like golf or visiting an arboretum, we assigned only the "extra value" (if any); that is, if a round of golf costs $20 on a public course and $80 on a private course, the direct use value of the public course would be $60. Under the theory that the second and third repetitions of a park use in a given period are slightly less valuable than the first use (i.e., the value to a child of visiting a playground the seventh time in a week is somewhat lower than the first), we incorporated an estimated sliding scale of diminishing returns for heavy park users. For example, playground value diminishes from $3.50 for the first time to $2.25 for the sixth time in a week. As the weather in the Piedmont has its warm and cold months, we also estimated a time span for different park uses to take into account reduced participation in different seasons, depending on the activity. (Although some people are active in parks 365 days a year, we chose to err on the side of conservatism and eliminated seasons when participation rates drop to low levels, though some activities, such as using an indoor recreation center, are year-round.) Finally, for the few activities for which a fee is charged—such as use of weight rooms and fields for league sports—we subtracted the per-person fee from the imputed value.

A professionally conducted random-digit-dialed telephone survey of 600 residents within Mecklenburg County collected data to determine the number of park visits and the activities engaged in. (The survey had an accuracy level of plus-or-minus 3 percent.) Residents were asked to answer for themselves; a representative proportion of adults with children under the age of 18 were also asked to respond for one of their children. (The calculation includes only residents of Mecklenburg County. The value from what out-of-town visitors spend because of park visitation is covered on pages 7-8.)

The result of the Direct Use Calculator was $841,461,062 for 2009. (See Table 3.)

While it can be claimed that this very large number is not as "real" as the numbers for tax or tourism revenue, it nevertheless has true meaning. Certainly, not all these park activities might take place if they had to be purchased, but county residents truly are getting pleasure and satisfaction from their use of the parks. If they had to pay and consequently reduced some of this use, they would be materially "poorer" from not doing some of the things they enjoy.

Table 3. The Economic Value of Direct Use of Parks in Mecklenburg County

Facility/Activity	Person Visits	Average Value per Visit	Value
Common activities (playgrounds, trails, dog walking, picnicking, tennis, bicycling, sports, etc.)	198,341,007	$4.03	$799,393,060
Other uses (fishing, camping, golfing, attending a festival, etc.)	6,974,318	$6.03	$42,068,002
Total			$841,461,062

4. Health Value

There is increasing evidence from experts that obesity and physical inactivity are becoming a major public health problem that, in addition to human misery, has expensive economic consequences. One recent report by the federal Centers for Disease Control and Prevention (CDC) estimates that in 2008, $147 billion in added costs could be attributed to obesity. Research suggests that nearby parks, programming at playgrounds, and a walkable urban form can help people increase their level of physical activity and reduce their medical expenses.

Cordelia Park Pool

The Health Benefits Calculator measures the collective economic savings realized by the use of parks by Mecklenburg County residents. We created the calculator by identifying the common types of medical problems that are inversely related to physical activity, such as heart disease and diabetes. Based on studies that have been carried out in seven different states, we assigned a value of $351 as the cost difference in current dollars between those who exercise regularly and those who do not. For persons over the age of 65, we doubled that value to $702 in today's dollars because seniors typically incur two or more times the medical care costs of younger adults. (The calculator makes one additional computation, applying a small multiplier to reflect the differences in medical care costs between Mecklenburg County and the United States as a whole.)

The key data input for determining medical cost savings is the number of park users engaging in a sufficient amount of physical activity to make a difference. The Centers for Disease Control and Prevention defines this as at least 150 minutes of moderate activity, or at least 75 minutes of vigorous activity, per week.

The same telephone survey that collected the direct use data (see page 9) also collected data to determine residents' physical activities and their frequency, dividing respondents by age. In order to modify the results to serve the health benefits study, we eliminated low-heart-rate uses such as picnicking, sitting, strolling, and birdwatching. We also dropped all respondents who engaged in strenuous activities fewer than three times per week for not being active enough for health benefit, in accordance with CDC guidelines. Likewise, for less-vigorous activity, respondents were not valued if they did not engage in activities at least four times per week.

In Mecklenburg County, we estimated that 280,626 residents—265,503 younger than 65 and 15,123 older—engaged actively enough in parks to cut their health costs. The combined health savings due to park use for the residents of Mecklenburg County in 2009 was $81,489,217. (See Table 4.)

Table 4. Physical Activity Health Benefits Calculator, Mecklenburg, North Carolina

Average annual medical care cost difference between active and inactive persons over 65 years of age	$351
Number of adults under 65 years of age who are physically active in the park	265,503
Subtotal of health care benefits for adults under 65 years of age	$93,191,726
Average annual medical care cost difference between active and inactive persons over 65 years of age	$702
Number of adults 65 and older who physically active in the park	15,123
Subtotal of health care benefits for adults 65 years of age and older	$10,616,194
Subtotals combined	$103,807,920
Regional multiplier	.785
Total annual value of health benefits from physical activity in the park	$ 81,489,217

Calculations based on persons engaging in moderate or vigorous activity as defined by CDC Guidelines for Physical Activity: http://www.cdc.gov/physicalactivity/everyone/guidelines/adults.html.

5. Community Cohesion Value

Along with schools, churches, and other social gathering places, parks are key sources of community. As several studies have shown, the institutions that make up this web of human relationships can make a neighborhood stronger, safer, and more successful. Aside from the great social value in people caring about their communities, there is monetary value that is benefiting neighborhoods and the entire county.

This human web, for which urban anthropologist Jane Jacobs coined the term "social capital," is strengthened in some communities by parks. From playgrounds to sports fields to park benches to chessboards to swimming pools to ice skating rinks to flower gardens, parks offer opportunities for people of all ages to communicate, compete, interact, learn, and grow. For example, a group that provides free concerts not only brings those concert-goers together, but also enlivens the park and adds quality of life to the county. Perhaps more significant, the acts of improving, renewing, or even saving a park can build extraordinary levels of social capital in a neighborhood that may well be suffering from fear and alienation partially due to the lack of safe public spaces. Groups such as the Mountainbrook Civic Association and the Tarheel Trailblazers have garnered support for parks and gathered neighbors for their cause.

Teenage volunteers in Freedom Park

The economic value of social capital is not entirely identifiable and is in some ways priceless, but it is possible to tally up a proxy based on real numbers—the amount of time and money that residents donate to their parks. Mecklenburg County has thousands of park volunteers who do everything from picking up trash and pulling vines to planting flowers, raising playgrounds, teaching about the environment, educating public officials, and contributing dollars toward a better county.

To arrive at the proxy number, we tallied all the financial contributions made to "friends of parks" groups, community organizations, nonprofits, and foundations, using the most recent data available, from 2008. We also included all the hours of volunteer time donated directly through the county's volunteer programs as well as through park organizations; we then multiplied the hours by the value assigned to volunteerism in 2009—$20.25—by the Points of Light Foundation.

The result of the Social Capital Calculator for Mecklenburg County is $2,516,484. (See Table 5.)

Table 5. Community Cohesion Value, Park Supporters in Mecklenburg County

	Volunteer Hours	Value of Volunteer Hours*	Financial Contributions	Total
County volunteer programs	112,998	$2,288,210	-	$2,288,210
Other organizations	9,215	$186,604	$41,670	$228,274
Total	**122,213**	**$2,474,814**	**$41,670**	**$2,516,484**

6. Reducing the Cost of Managing Urban Stormwater

Freedom Park

Stormwater runoff is a significant problem in cities. When rainwater flows off roads, sidewalks, and other impervious surfaces, it carries pollutants with it. Unfiltered rainwater can flow directly into waterways, causing significant ecological problems.

Mecklenburg County's parks, from the trees and vegetation of Latta Plantation Nature Reserve to the filtering and buffer effect of the fields of Frasier Park, reduce stormwater management costs by capturing precipitation and/or slowing its runoff. Large pervious (absorbent) surface areas allow precipitation to infiltrate and recharge the groundwater. Also, vegetation provides considerable surface area that intercepts and stores rainwater, allowing some to evaporate before it ever reaches the ground. In effect, urban green spaces function like mini-storage reservoirs and are the original form of green infrastructure.
The Western Research Station of the U.S. Forest Service in Davis, California, developed a model to estimate the value of retained stormwater runoff from this public green space. Inputs to the model consist of geographic location, climate region, surface permeability index, park size, land cover percentages, and types of vegetation. The model, while excellent, is not perfect; because of numerous data challenges, it thus far gives only a preliminary indication of the stormwater control value of Mecklenburg County's park system.

First we studied land cover (trees, open grassy areas, impervious surface, etc.) through analysis of data obtained from Mecklenburg County. This analysis by computer mapping (known as a geographic information system, or GIS) revealed the perviousness of Mecklenburg County parks. The impervious portion consists of roadways, asphalt trails, parking areas, buildings, hard courts, and also water surface.

Mecklenburg County Parkland Perviousness

Type of Cover	Acres	Percent
Pervious	17,767	96.9%
Impervious	429	2.3%
Water features	144	0.8%
Total	18,340	100.0%

Mecklenburg County Perviousness
(without parkland or surface water)

Type of Cover	Acres	Percent
Total pervious	181,967	59.4%
Total impervious	124,588	40.6%
Total (without water or parks)	306,556	100.0%

Next, we analyzed the same data for the amount of perviousness of the *rest* of Mecklenburg County—in other words, the county without its parkland. The pervious land consists largely of residential front and backyards, private natural areas such as cemeteries, institutional grounds, and office campuses. Naturally, the county as a whole has a higher percentage of hardscape than its parks. Our calculation methodology compares actual runoff *with* parks against the theoretical runoff that would occur if there were *no* parks.

Third, we calculated the amount and characteristics of rainfall from U.S. weather data. Mecklenburg County's typical weather pattern consists of abundant sunshine, an average of 42.22 inches of rainfall distributed throughout the year and very little snowfall. Our model uses hourly annual precipitation data to estimate annual runoff. The reduced amount of runoff with parks compared to the surrounding county development pattern is 549,200,545 cubic feet.

The final step in determining the economic value of the park system's contribution to clean water is calculating what it costs to manage stormwater using "hard" infrastructure (e.g., concrete pipes, sewers, and the like). This is not a generally known number and, in fact, is difficult to ascertain. For instance, acquiring easements, restoring a stream in a park, or constructing a wetland on public property are sometimes components of stormwater capital improvement costs. To obtain an estimate, we divided spending on stormwater facilities for 2009 by an estimate of the total amount of water conveyed by the county's system (i.e., the rain falling on the developed areas of the county). This works out to a cost for stormwater conveyance of $.0344 per cubic foot. (See Table 6.)

Overall, by considering the rainfall, parkland, imperviousness, and treatment cost factors, we obtained a total annual Stormwater Retention Value of $18,892,499 for the park system of Mecklenburg County in 2009.

Table 6. Stormwater Cost Savings from Parks in Mecklenburg County

Typical Year	Inches	Cubic Feet
Rainfall	42.22	2,810,706,039 cu. ft.
Runoff with parks		465,945,691 cu. ft.
Runoff without parks		1,015,146,236 cu. ft.
Runoff reduction from parks		549,200,545 cu. ft.
Runoff reduction rate		54%
Cost of treating stormwater ($ per cubic foot)		$0.0344
Total savings due to park runoff reduction		$18,892,499

7. Air Pollution Removal Value

Air pollution in cities can injure health and damage structures, creating both an environmental and an economic problem. Human cardiovascular and respiratory systems can be affected with broad consequences for health costs and productivity. In addition, acid deposition, smog, and ozone increase the need to clean, repair, or repaint buildings, bridges, and other costly infrastructure.

The many trees and shrubs in Mecklenburg County's parks have the ability to remove air pollutants such as nitrogen dioxide, sulfur dioxide, carbon monoxide, ozone, and some particulate matter. Leaves absorb gases, and particulates adhere to the plant surface. The vegetation present in county parks plays a role in improving air quality, helping urban residents avoid costs associated with pollution.

In order to quantify the contribution of park vegetation to air quality, the Northeast Research Station of the U.S. Forest Service in Syracuse, New York, designed a calculator to estimate pollution removal and value for urban trees. This program, which is based on the Urban Forest Effects (UFORE) model of the U.S. Forest Service, is location-specific, taking into account the air pollution characteristics of Mecklenburg County. (Different cities or counties can generate different results based on differences in ambient air quality.)

Four Mile Creek Greenway

First, we obtained land cover information for all of Mecklenburg County's parks through analysis of the county's tree canopy using computerized mapping based on a digitized assessment of aerial photography. While Mecklenburg County has many trees on streets and private property, this study measured only the economic value of trees on public parkland and parkways. Based on this, we found that 14,280 acres, or 77.9 percent of the county's 18,340 acres of parks, are covered with trees.

Then we considered the pollutant flow through the area within a given time period (known as "pollutant flux"), taking into account the concentration of pollutants and the velocity of pollutant deposition. (The Air Quality Calculator uses 2000 Environmental Protection Agency hourly pollution concentration data.) We also took into account the resistance of the tree canopy to the air, the behavior of different types of trees and other vegetation, and seasonal leaf variation. We then multiplied the total pollutant flux by tree-canopy coverage to estimate total pollutant removal by trees in the study area. Finally, we estimated the monetary value of pollution removal by trees using the median U.S. externality values for each pollutant. (The externality value refers to the amount it would otherwise cost to prevent a unit of that pollutant from entering the atmosphere. For instance, the externality value of preventing the emission of a short ton of carbon dioxide is $870; the externality value of the same amount of sulfur dioxide is $1,500.)

The result of the Air Quality Calculator for the park system of Mecklenburg County in 2009 was an economic savings of $3,889,091. (See Table 7.)

Table 7. The Role of Parks in Cutting Air Pollution Costs in Mecklenburg County

	Tons Removed	Dollars Saved per Ton Removed	Pollutant Removal Value
Carbon dioxide	24,341	$870	$10,588
Nitrogen dioxide	143,160	$6,127	$438,569
Ozone	821,553	$6,127	$2,516,827
Particulate matter	413,458	$4,091	$845,728
Sulfur dioxide	103,172	$1,500	$77,379
Total			**$3,889,091**

Conclusion

While reams of urban research have been carried out on the economics of housing, manufacturing, retail, and even the arts, there has been until now no comprehensive study in Mecklenburg County on the worth of the county's park system. The Trust for Public Land believes that answering this question—"How much value does a park system bring to a city or county?"—can be profoundly helpful and useful. For the first time, parks in Mecklenburg County can be assigned the kind of numerical underpinning long associated with transportation, trade, housing, and other sectors. Urban analysts will be able to obtain a major piece of missing information about how cities work and how parks fit into the equation. Housing proponents and other urban constituencies will potentially be able to find a new ally in local park advocates. And mayors, city and county councils, and chambers of commerce may uncover the solid, numerical motivation to strategically acquire parkland in balance with community development projects.

North Carolina is a state known for its great offering of natural features and recreational opportunities. The great outdoors and great recreation opportunities can be found right within Mecklenburg County's boundaries in its over 17,600 acres of parks and trails. From Clanton Park to Independence Park to the development-enhancing Little Sugar Creek in downtown Charlotte, residents of Mecklenburg County are fortunate to have such a wide variety of spaces that offer real economic benefits.

Research by economists Gerald Carlino and Albert Saiz has concluded that metropolitan areas rich in amenities such as parks, historic sites, museums, and beaches "disproportionately attracted highly educated individuals and experienced faster housing price appreciation." In their research and writing, academics such as Richard Florida, John Crompton, and Hank Savitch have indicated that great parks, trails, and recreational amenities are key ingredients to attracting talent and distinguishing a city or county as good places to live.

This study has shown local benefits from Mecklenburg County's parks on property values and taxes, increased economic development and tax revenue from tourism, improved quality of life from publicly available amenities, a healthier and more interconnected citizenry, and an enhanced ability to deal with the environmental challenges of stormwater management and air pollution.

Determining the economic value of a city or county park system is still a young science. More research and analysis are needed regarding park usership, park tourism, adjacent property transactions, water runoff and retention, and other measures. In fact, every aspect of local parks—from design to management to programming to funding to marketing—would benefit from much deeper investigation and analysis. This study is offered as a mechanism to begin a conversation about the present and future role of parks within the life—and economy—of Mecklenburg County.

Appendix I. Acknowledgments

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E. G. McPherson, Ph.D., U.S. Forest Service Western Research Station, Davis, Calif.
Sarah Nicholls, Ph.D., Department of Park, Recreation, and Tourism Resources, Michigan State University
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Appendix II. Colloquium Attendees

The following individuals took part in the colloquium "How Much Value Does a Park System Bring to a City," in October 2003.

Susan Baird, Denver Dept of Parks & Recreation, Denver, Colo.
Kathy Blaha, The Trust for Public Land, Washington D.C.
Blaine Bonham, Pennsylvania Horticultural Society, Philadelphia, Pa.
Glenn Brill, Ernst & Young, New York, N.Y.
Valerie Burns, Boston Natural Areas Network, Boston, Mass.
Patrice Carroll, Philadelphia Managing Director's Office, Philadelphia, Pa.
Donald Colvin, Indianapolis Dept of Parks and Recreation, Indianapolis, Ind.
Ernest Cook, The Trust for Public Land, Boston, Mass.
John Crompton, Texas A&M University, College Station, Tex.
Dick Dadey, City Parks Alliance, New York, N.Y.
Nancy Goldenberg, Philadelphia Center City Partners, Philadelphia, Pa.
Peter Harnik, The Trust for Public Land, Washington, D.C.
Nancy Kafka, The Trust for Public Land, Boston, Mass.
Alastair McFarlane, U.S. Dept of Housing & Urban Development, Washington, D.C.
Ken Meter, Crossroads Resource Center, Minneapolis, Minn.
Sarah Nicholls, Michigan State Univerisity, E. Lansing, Mich.
Joan Reilly, Pennsylvania Horticultural Society, Philadelphia, Pa.
Dan Stynes, Michigan State Univerisity, E. Lansing, Mich.
Patrice Todisco, Boston GreenSpace Alliance, Boston, Mass.
Susan Wachter, University of Pennsylvania, Philadelphia, Pa.
Guijing Wang, Centers for Disease Control, Atlanta, Ga.
Richard Weisskoff, Everglades Economics Group, N. Miami, Fla.
Wayne Weston, Mecklenburg Parks and Recreation Dept., Charlotte, N.C.
Jennifer Wolch, University of Southern California, Los Angeles, Calif.
Kathleen Wolf, University of Washington, Seattle, Wash.
Matt Zieper, The Trust for Public Land, Boston, Mass.

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Center for City Park Excellence
The Trust for Public Land
660 Pennsylvania Avenue SE, Suite 401
Washington, D.C. 20003
202.543.7552

National Office
The Trust for Public Land
101 Montgomery Street, Suite 900
San Francisco, CA 94104
415.495.4014

tpl.org